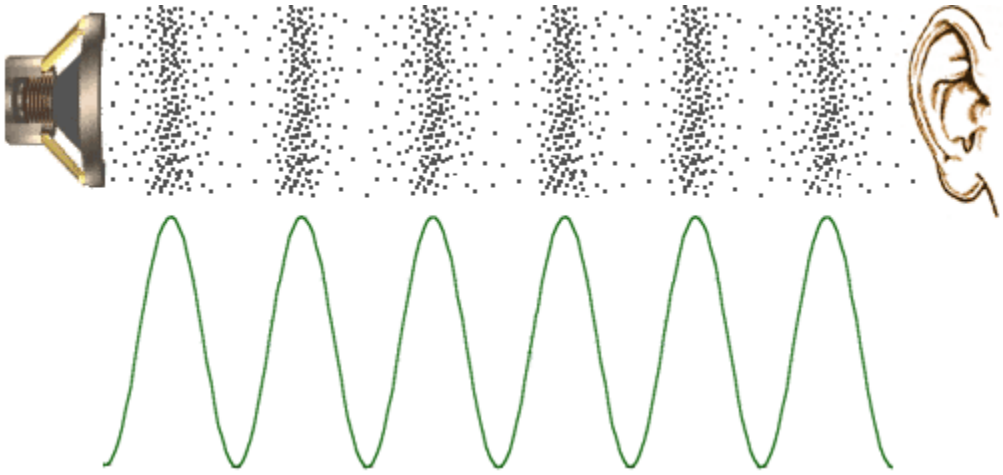
Special Senses

The Ears
(Equilibrium and Hearing)

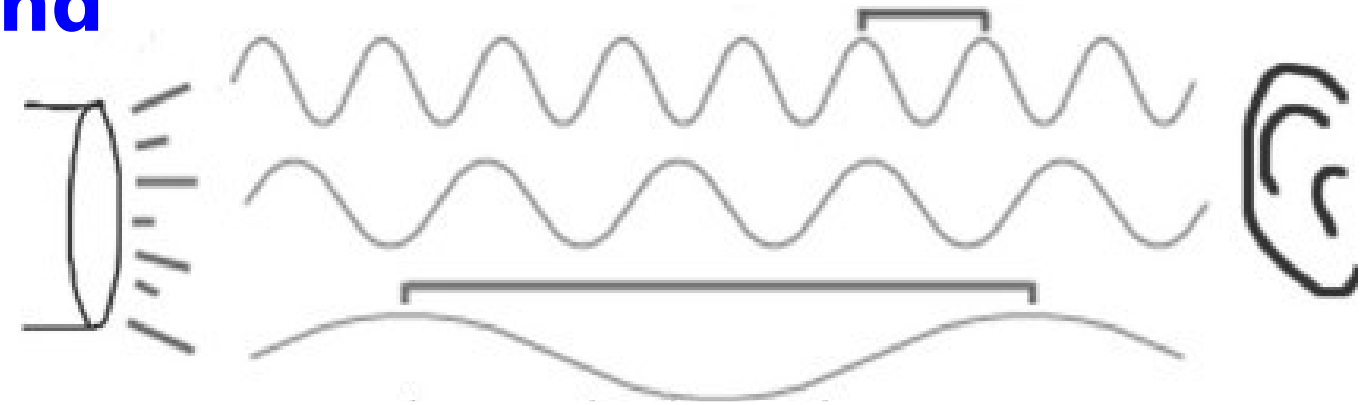
The Eyes
(Vision)

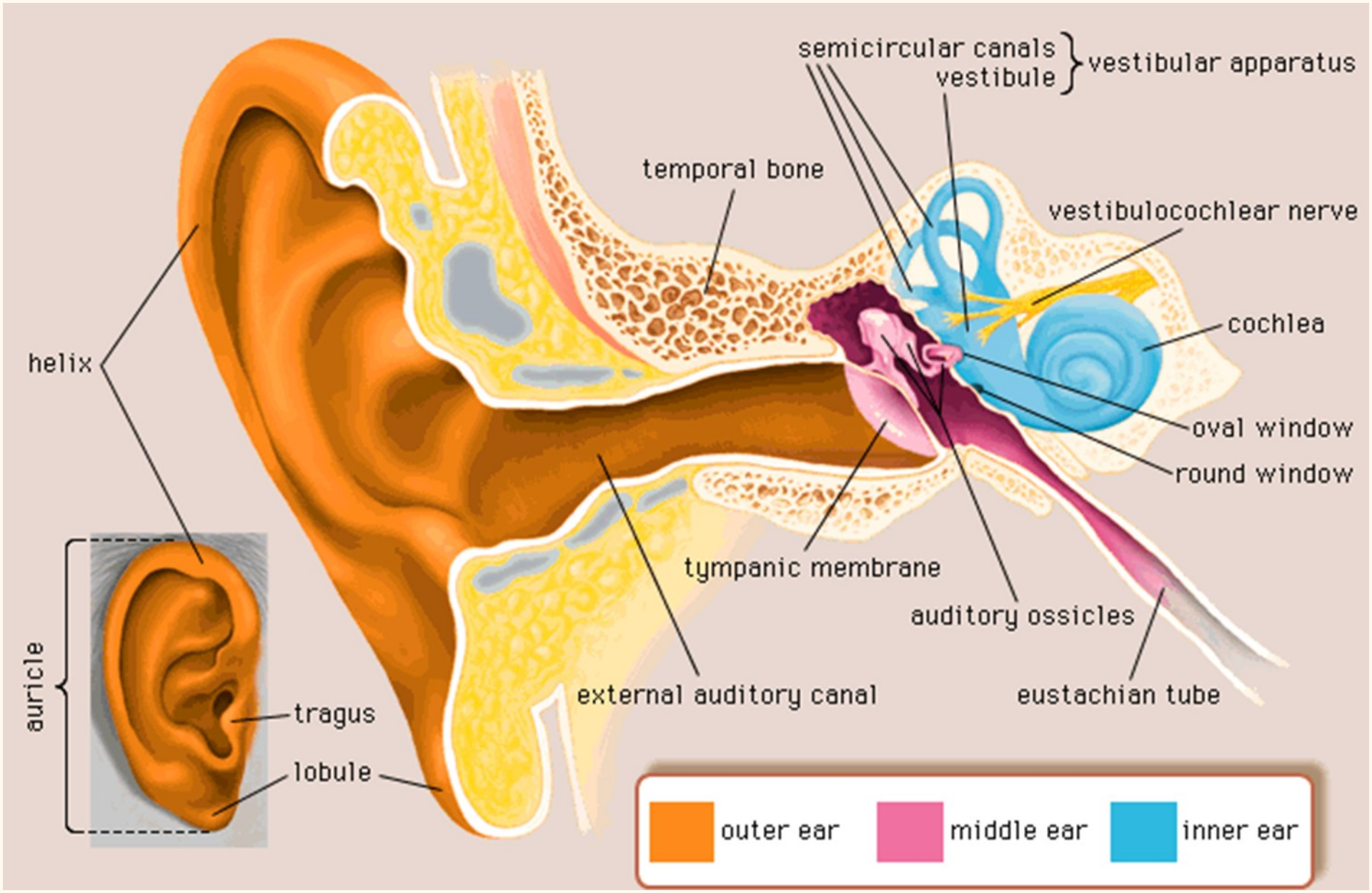
Sound Waves

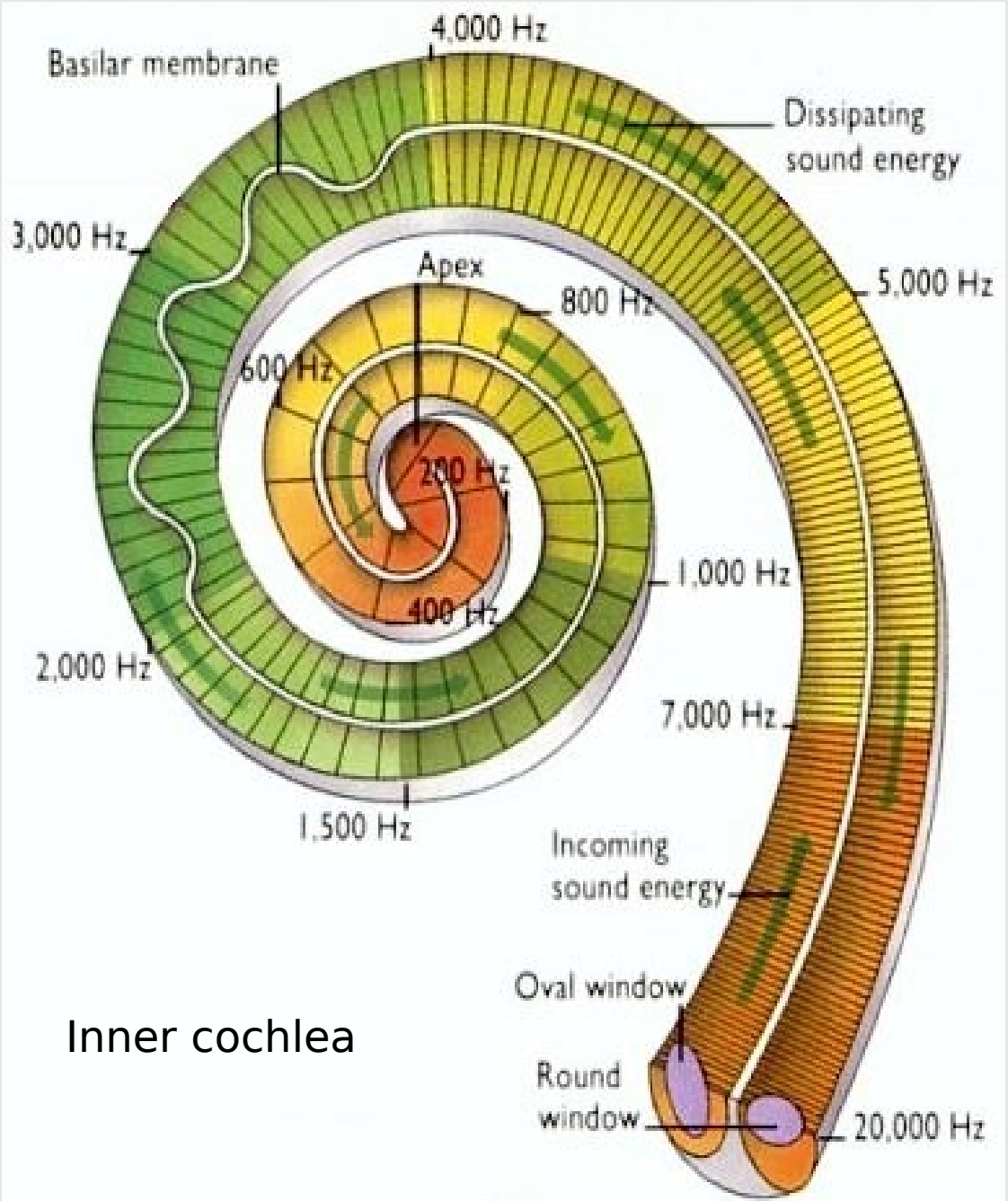


1. Frequency = wavelength -> pitch of sound

2. Amplitude = height of wave -> volume of sound




semicircular canals
vestibule
vestibular apparatus
temporal bone
vestibulocochlear nerve
cochlea
helix
oval window
round window
tympanic membrane
auditory ossicles
auricle
tragus
lobule
external auditory canal
eustachian tube
outer ear
middle ear
inner ear



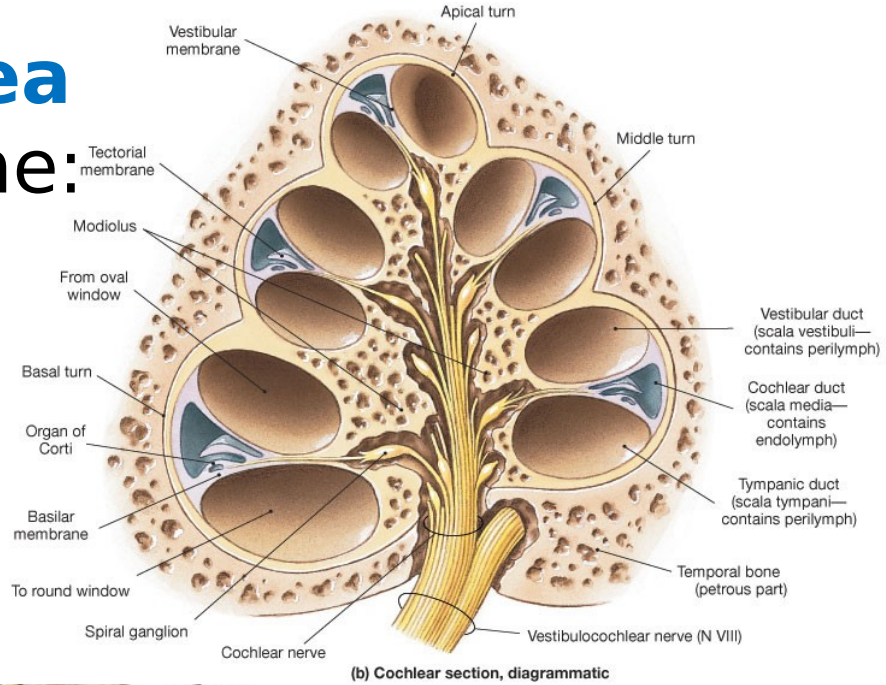
Inner cochlea

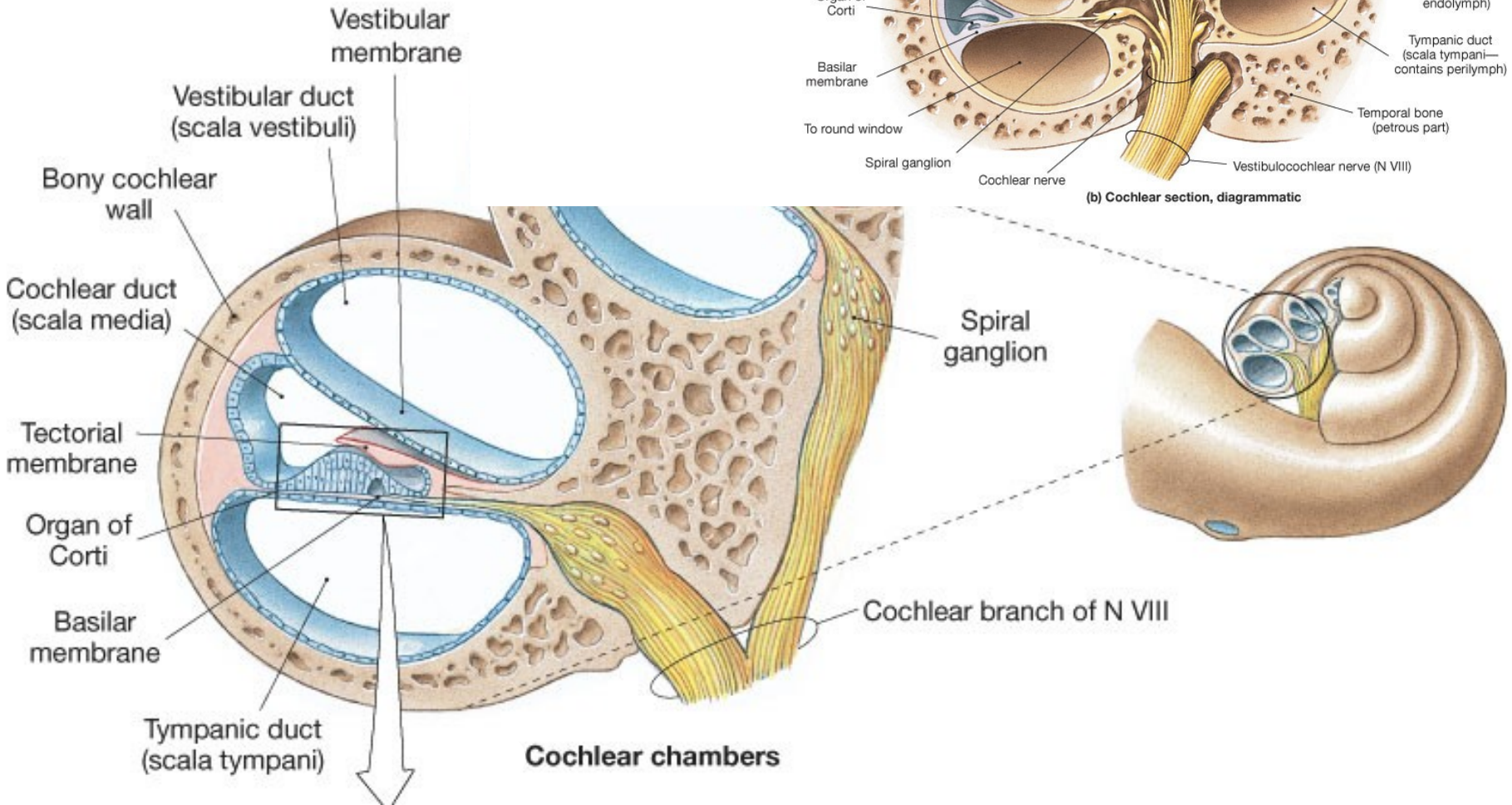
Sectional View of Cochlea

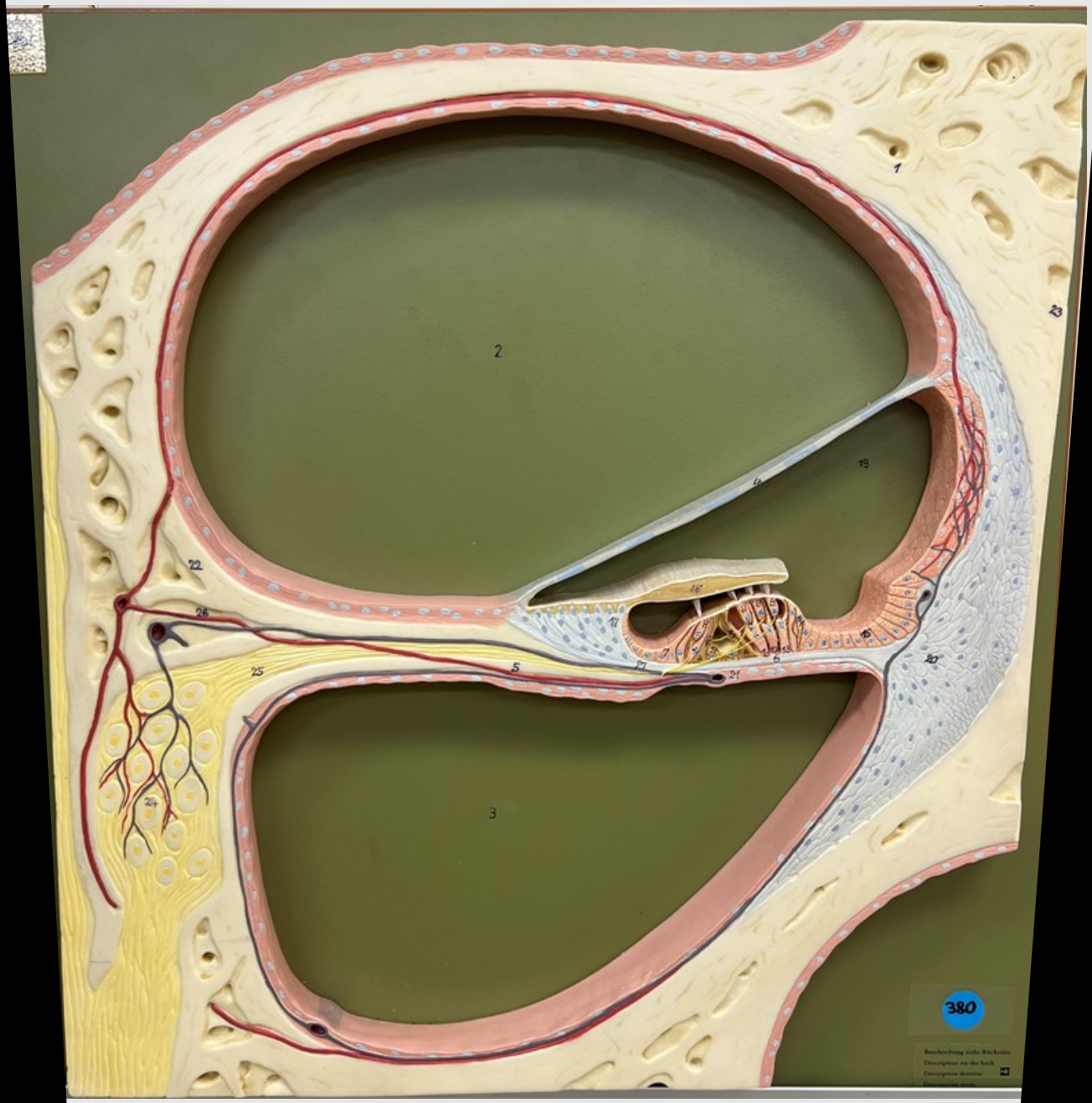
Showing arrangement of the:

3 Ducts

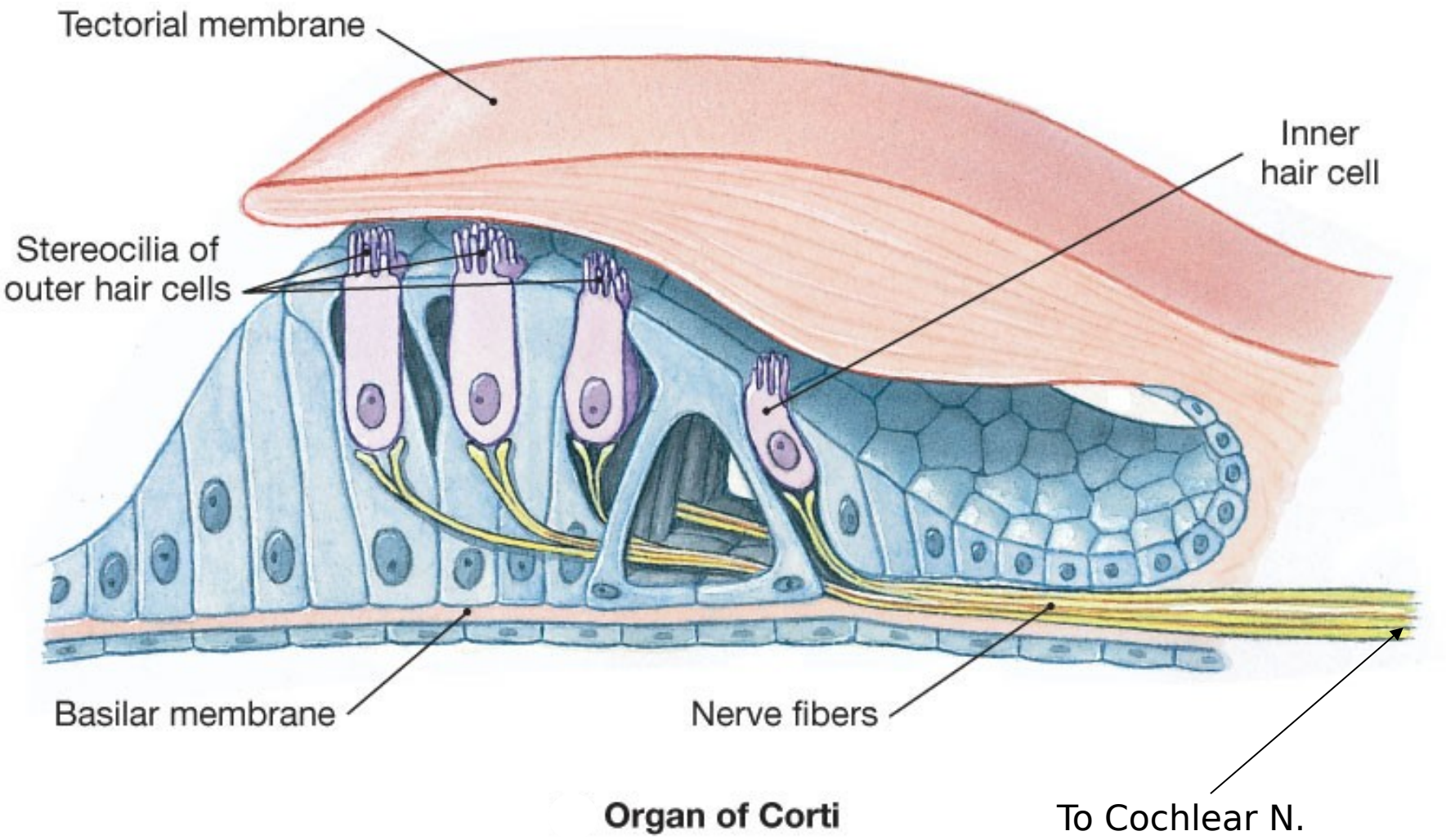
3 Membranes



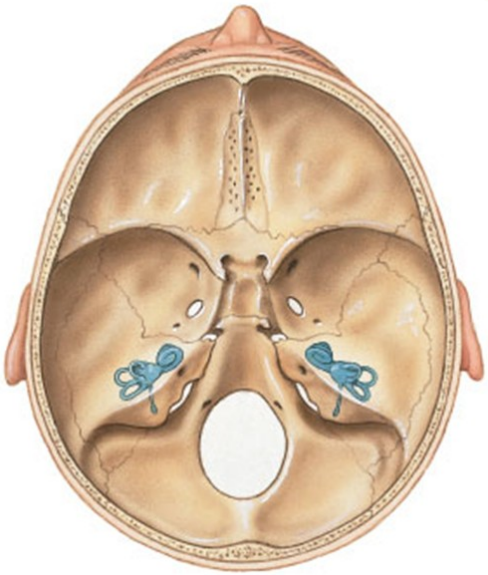


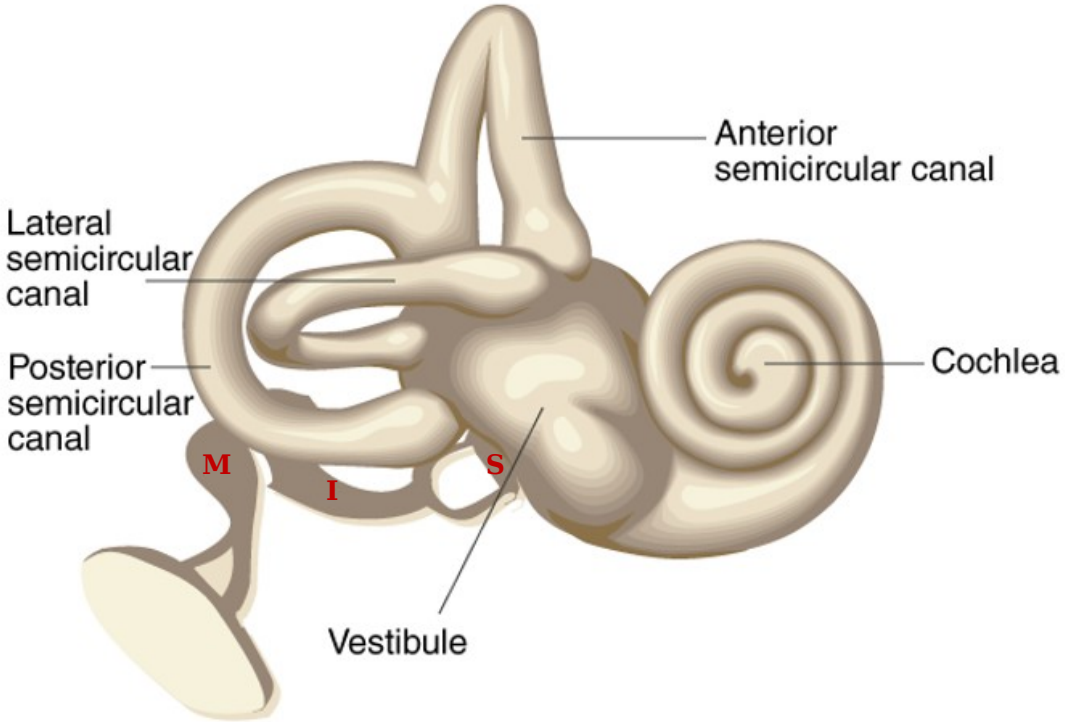

1
2
3
5
19
22
25
23
380

The Organ of Hearing

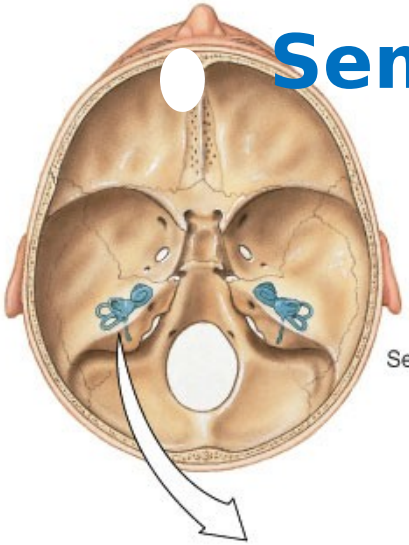


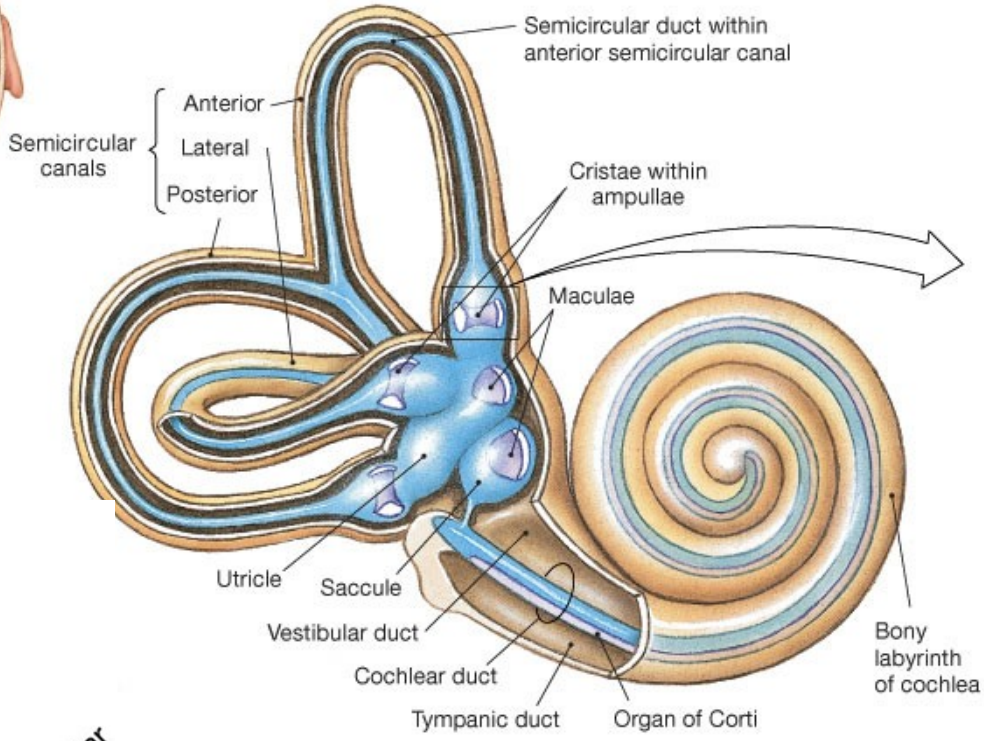
The Bony Labyrinth of the Inner Ear

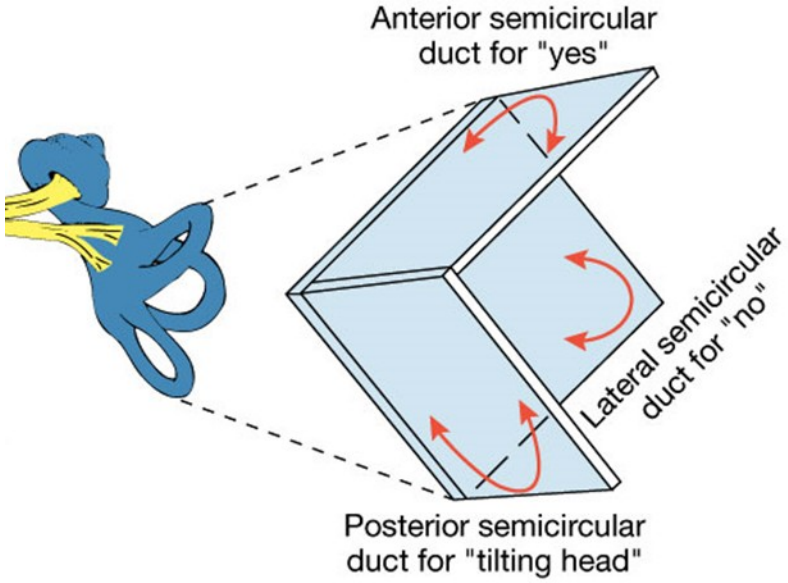




Semicircular Canals and Ducts

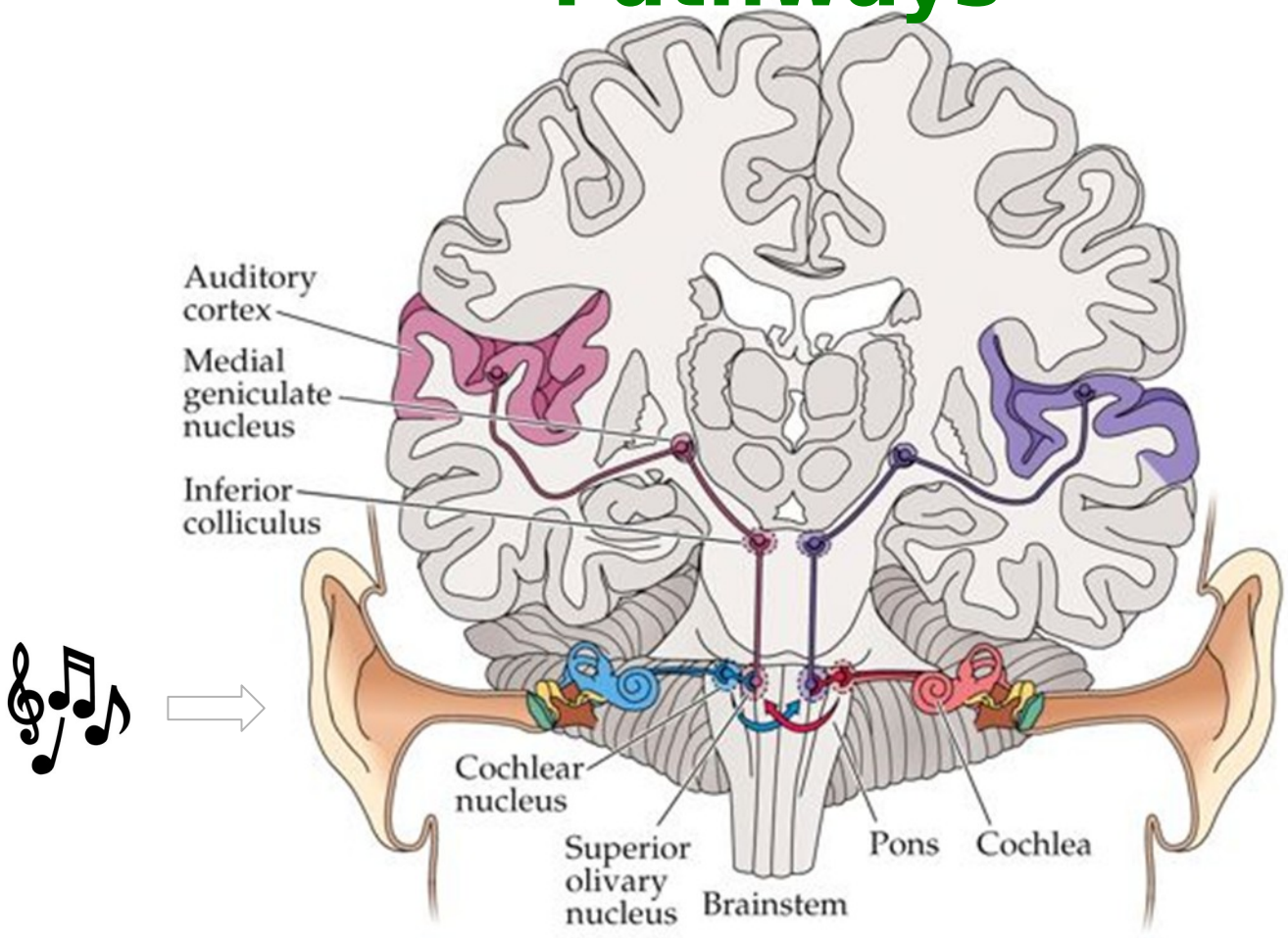






Maintain balance (equilibrium) by detecting rotational head movements

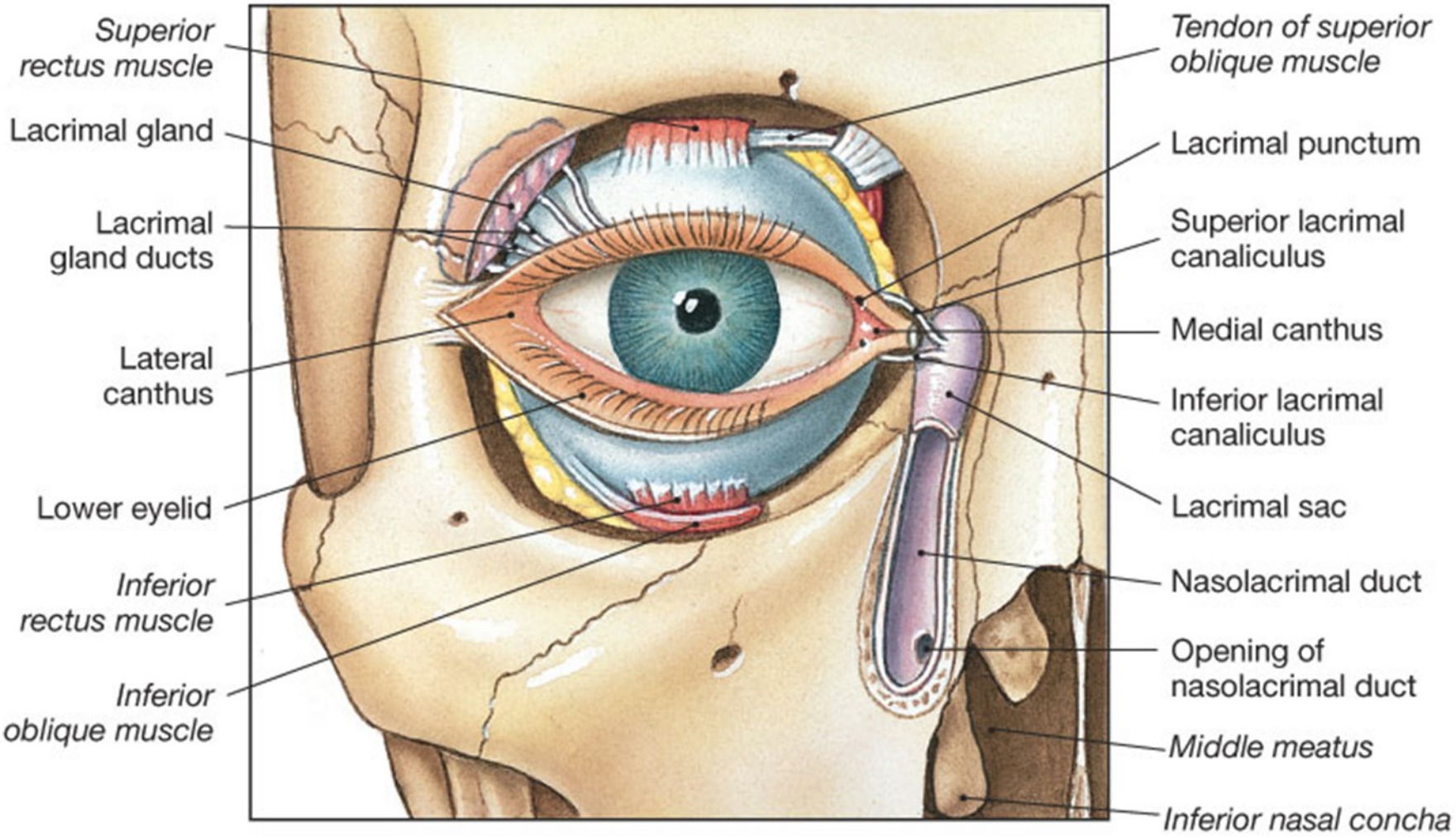
Ascending Auditory Pathways



The Eyes

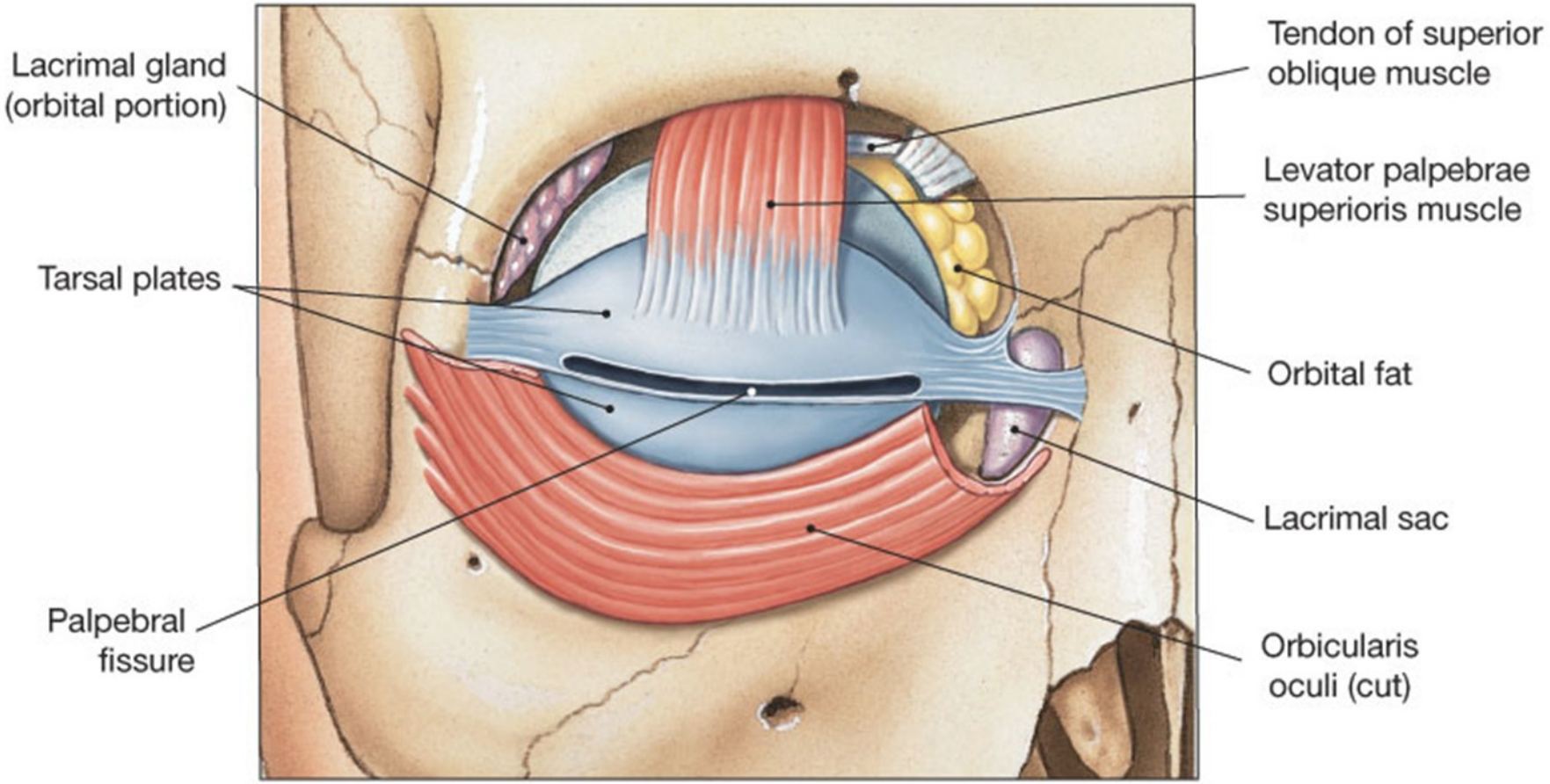
Q: What Makes Eyes Have Color?

The Eye in the Orbit

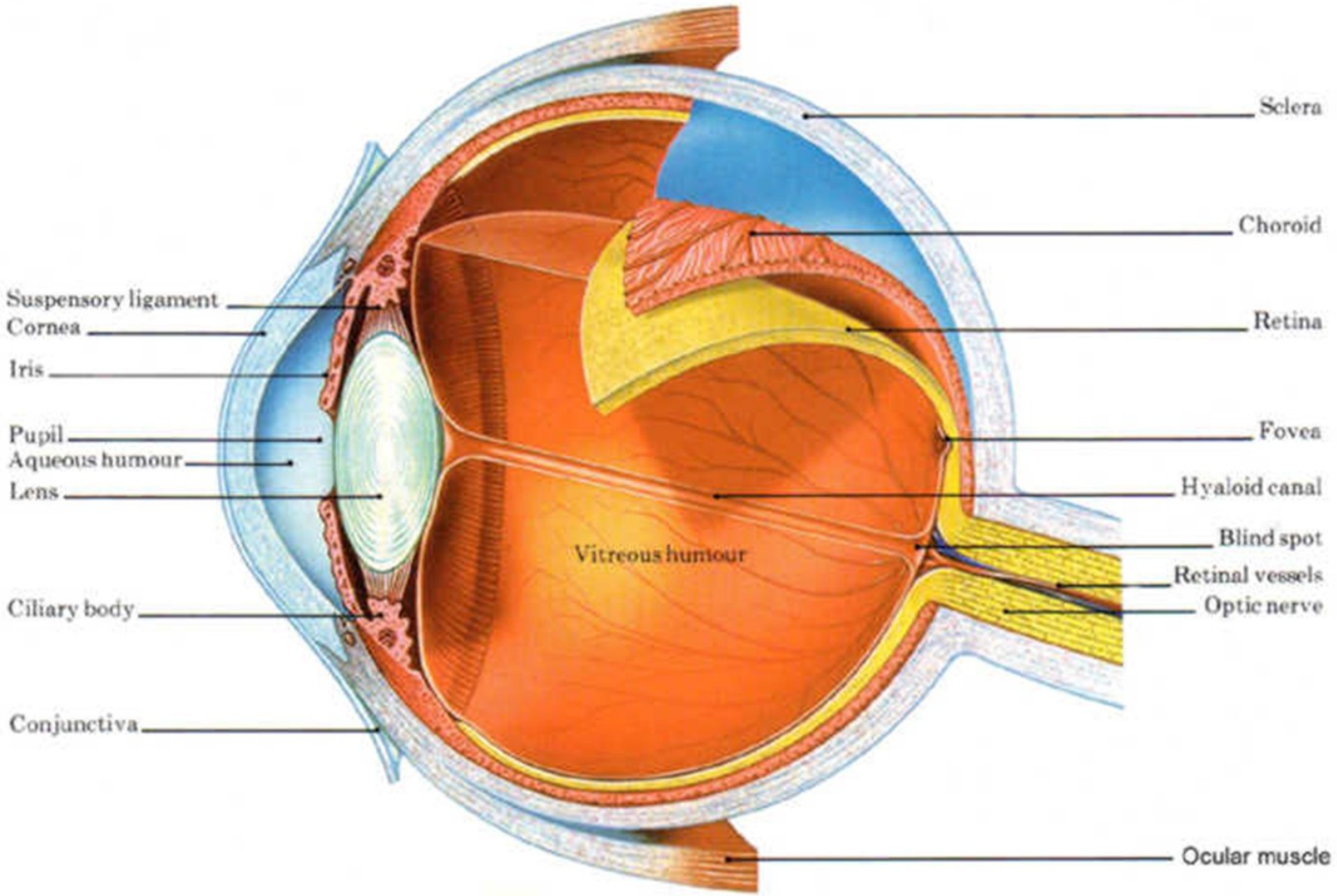


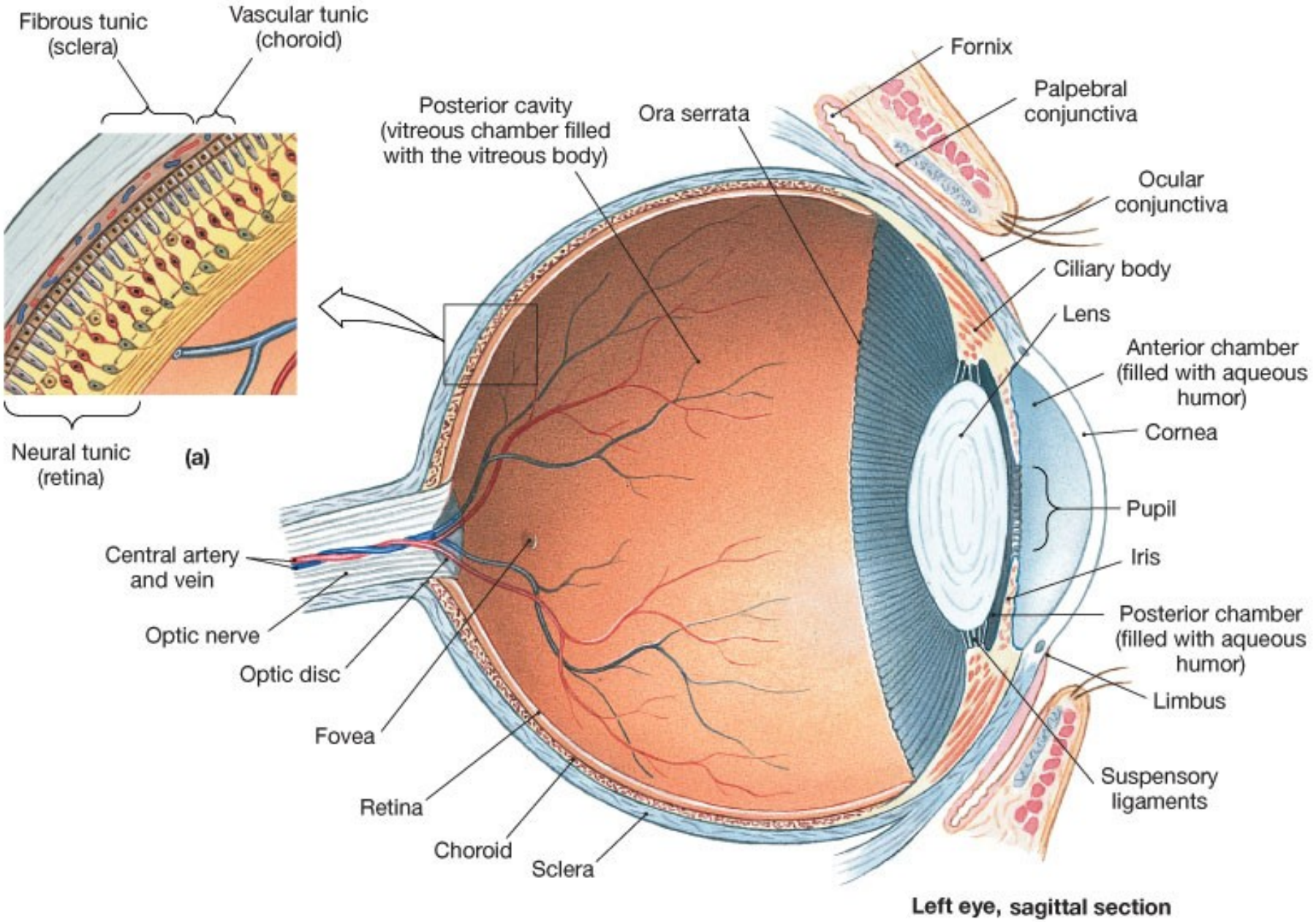
With the Lacrimal Apparatus

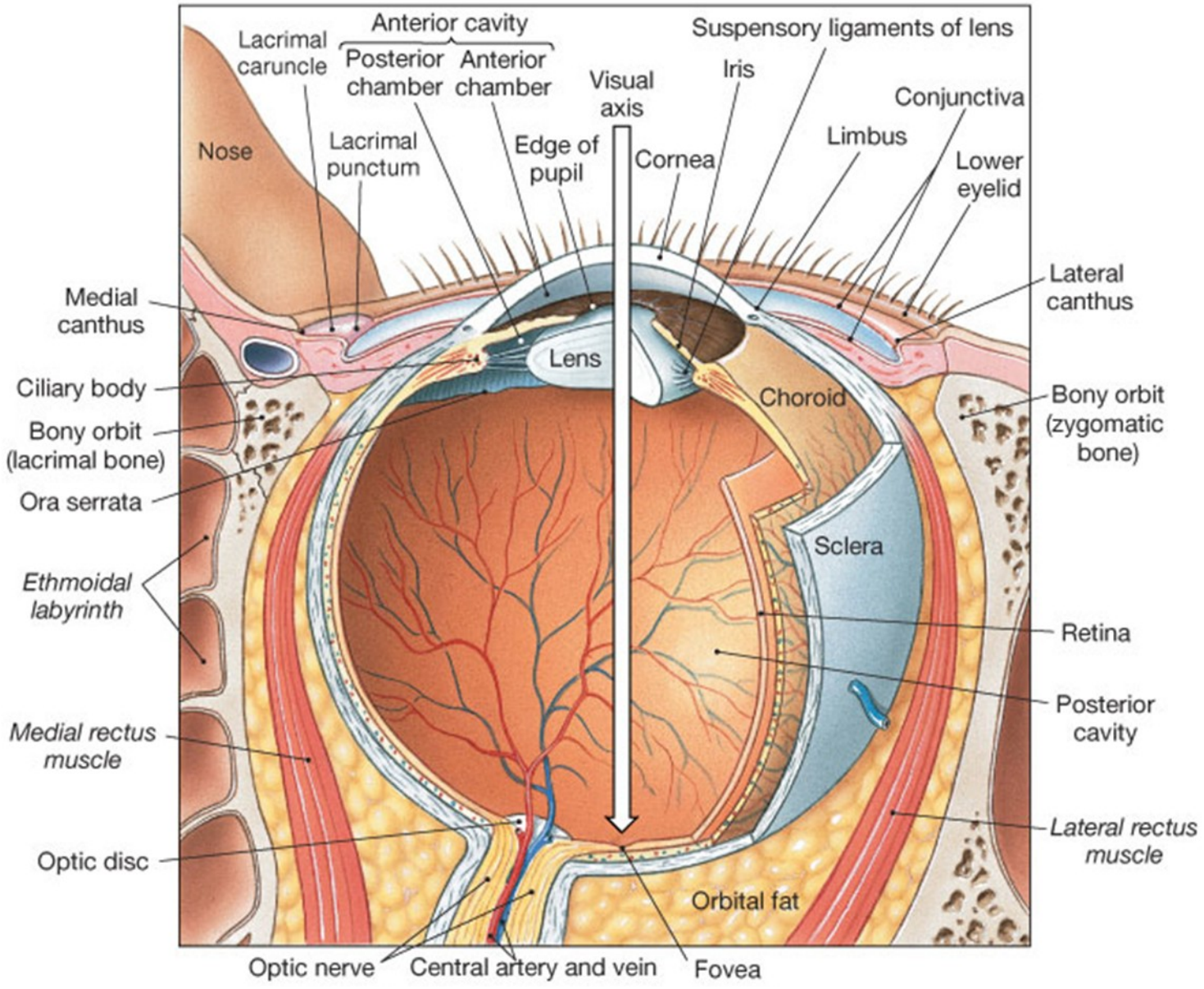
The Palpebrae Muscles



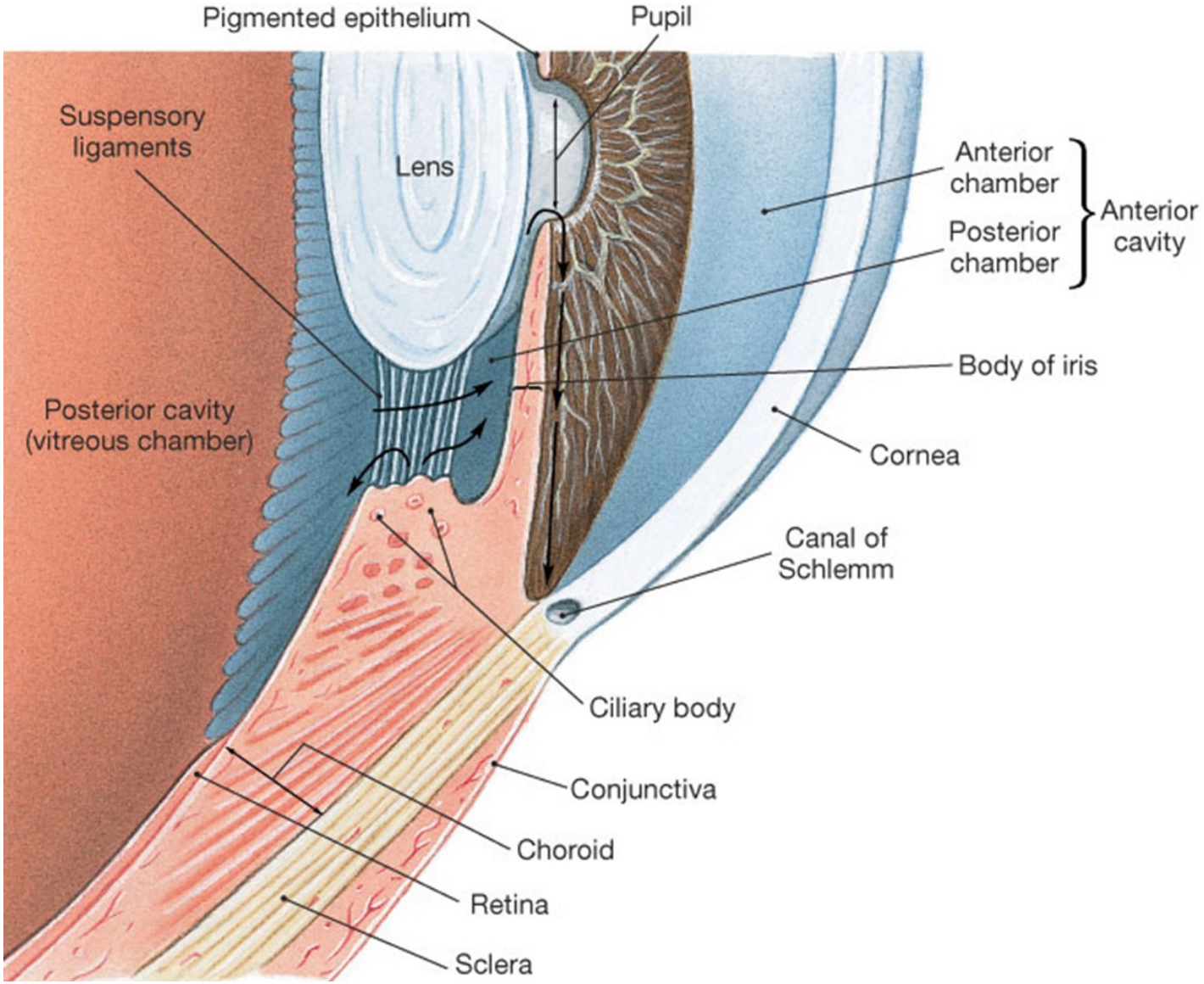
The Layers (Tunics) of the Eye




Fibrous tunic (sclera)
Vascular tunic (choroid)
Neural tunic (retina)
(a)
Posterior cavity (vitreous chamber filled with the vitreous body)
Ora serrata
Fornix
Palpebral conjunctiva
Ocular conjunctiva
Ciliary body
Lens
Anterior chamber (filled with aqueous humor)
Cornea
Pupil
Iris
Posterior chamber (filled with aqueous humor)
Limbus
Suspensory ligaments
Central artery and vein
Optic nerve
Optic disc
Fovea
Retina
Choroid
Sclera
Left eye, sagittal section


Anterior cavity
Lacrimal caruncle
Posterior chamber
Anterior chamber
Suspensory ligaments of lens
Iris
Visual axis
Conjunctiva
Limbus
Nose
Lacrimal punctum
Edge of pupil
Cornea
Lower eyelid
Lateral canthus
Medial canthus
Lens
Ciliary body
Choroid
Bony orbit (zygomatic bone)
Bony orbit (lacrimal bone)
Ora serrata
Sclera
Ethmoidal labyrinth
Retina
Posterior cavity
Medial rectus muscle
Lateral rectus muscle
Optic disc
Orbital fat
Optic nerve
Central artery and vein
Fovea

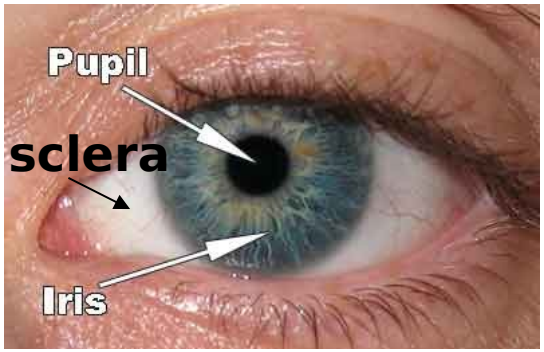
The Circulation of **Aqueous Humor** within the Anterior Cavity of the Eye



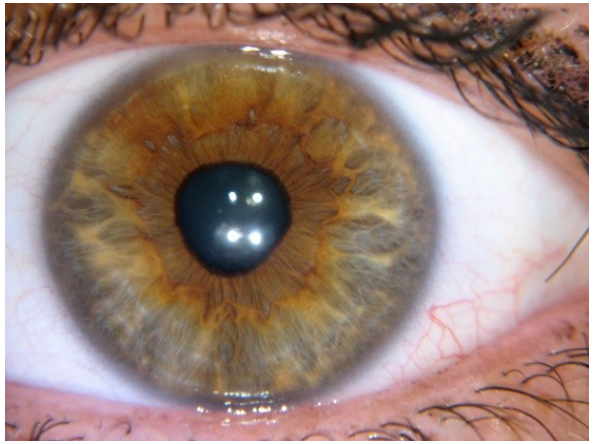
Conjunctiva - lines inside of eyelids and covers the sclera of the eye (= the whites of the eye). Made of non-keratinized **stratified squamous** and **stratified columnar** epithelium, + goblet cells.

It is **vascular** (has many tiny blood vessels),whereas the sclera is **avascular**.

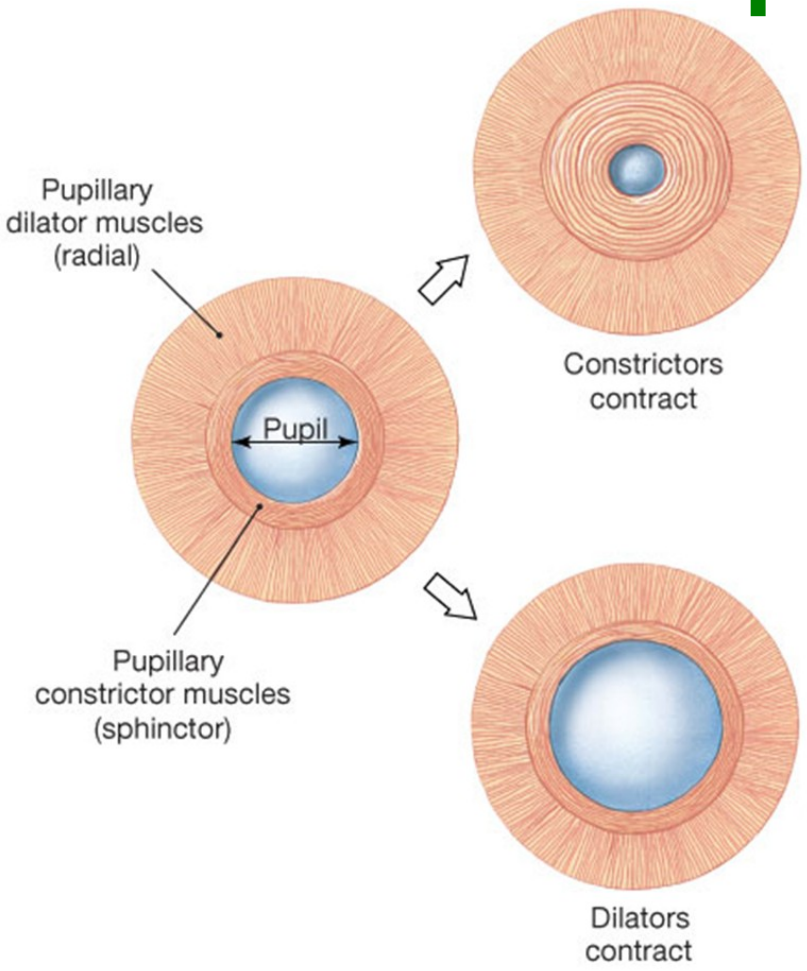
Other cells in conjunctival epithelium include melanocytes, T and B cell lymphocytes.

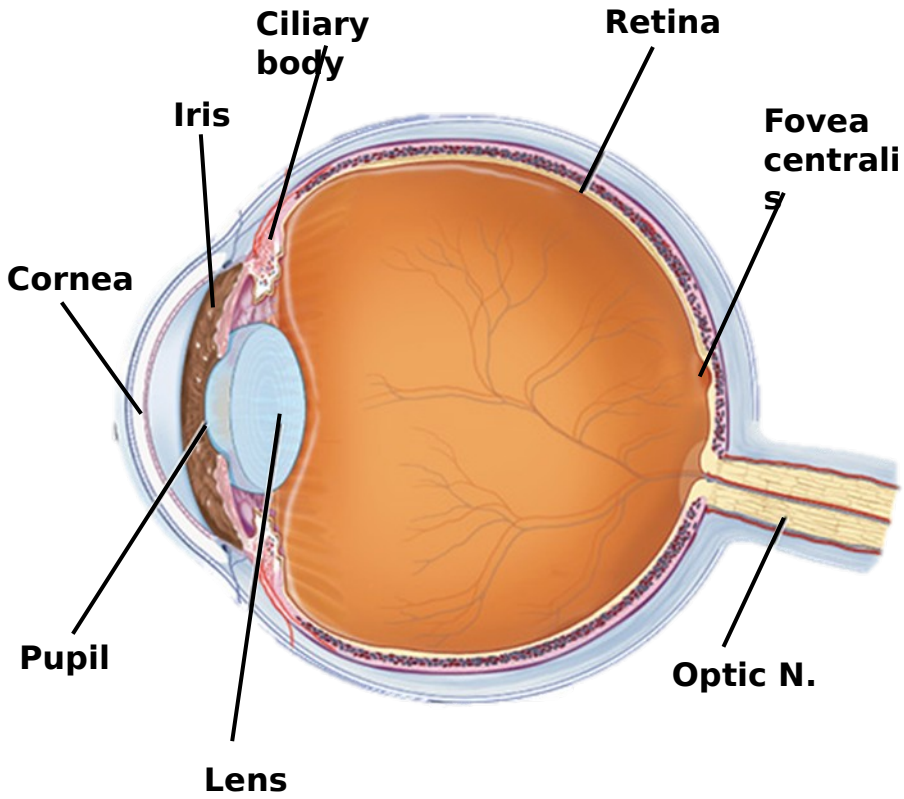


Conjunctivitis – when the conjunctiva becomes inflamed, from injury or irritation, also known as ‘pinkeye’.

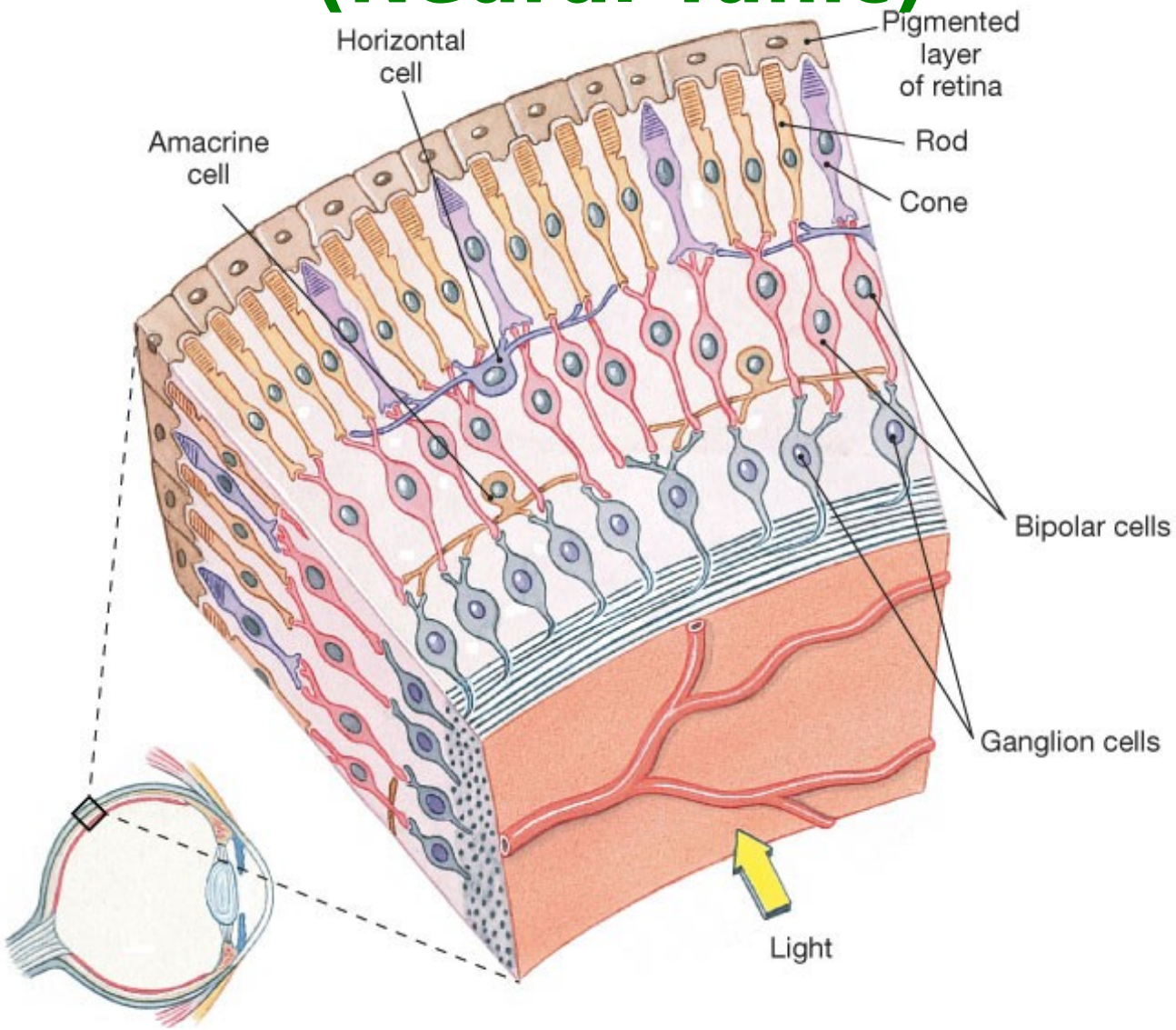


The Pupil and the Light Fixing Apparatus

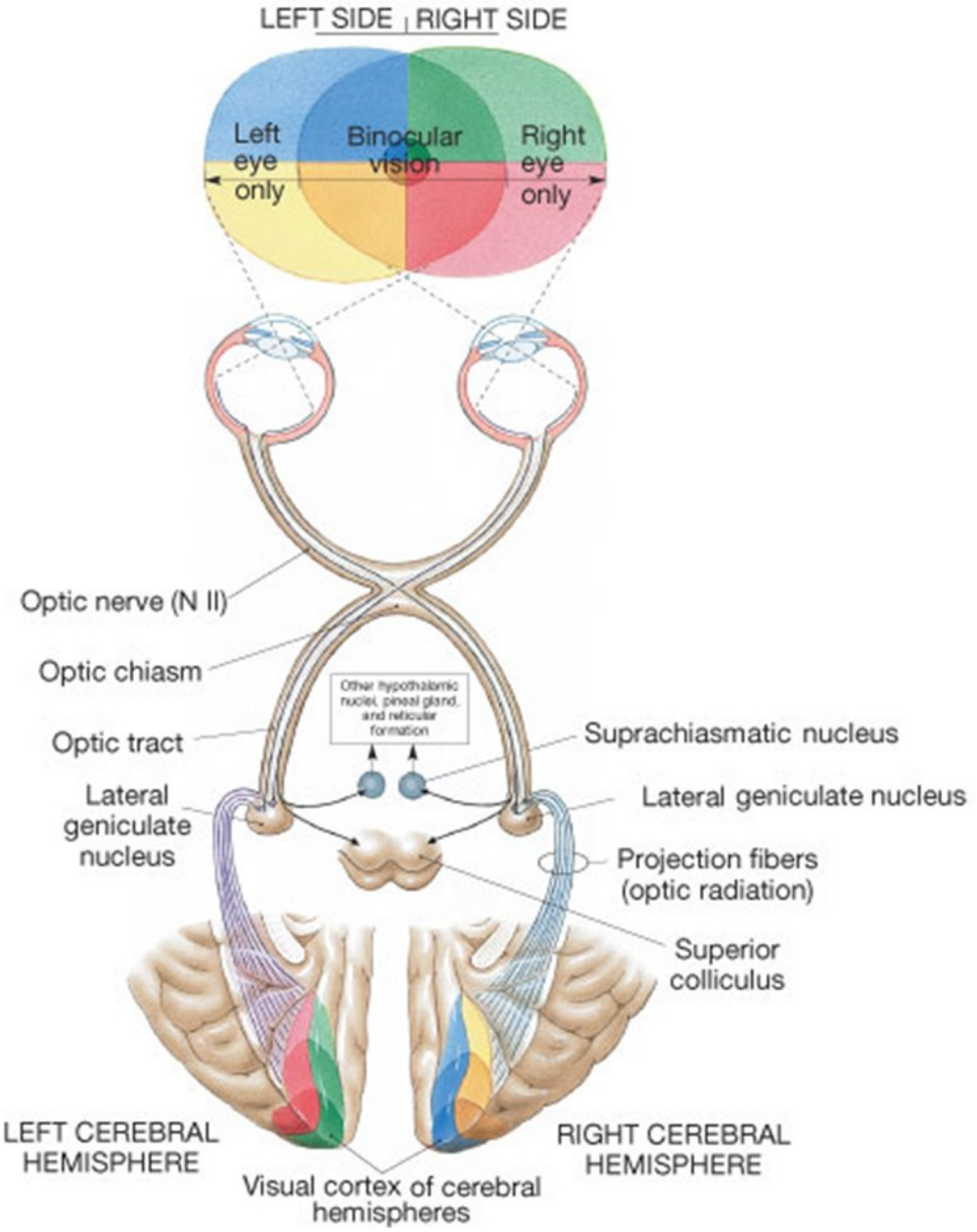




Layers of the Retina (Neural Tunic)



Visual Pathways



Vision

Visual Conditions

Myopia - near (short) sightedness. Results from light entering eye being focused in **front** of the **fovea centralis** of retina, rather than directly on it. Causes distant image to be out of focus. Commonly from the eyeball being too long, alters distance of the fovea onto which the light is being refracted (‘bent’ or focused).

Myopia often treated by concave corrective lenses (have a negative optical power).

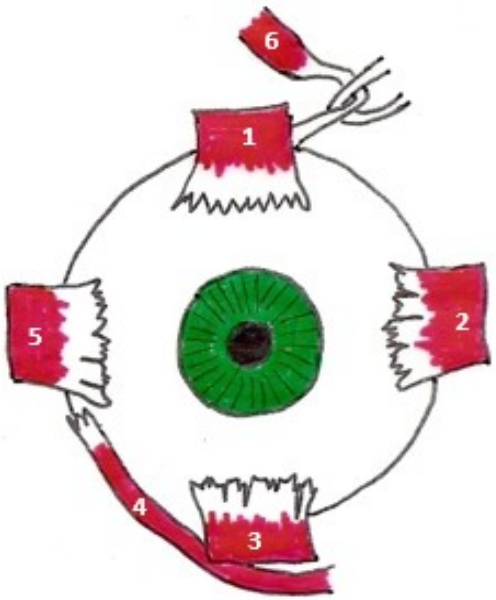
Hyperopia - far (long) sightedness. Eyes do not have enough power to see close or nearby objects. Results from light entering eye being focused in **behind** the **fovea centralis** of retina, rather than directly on it.

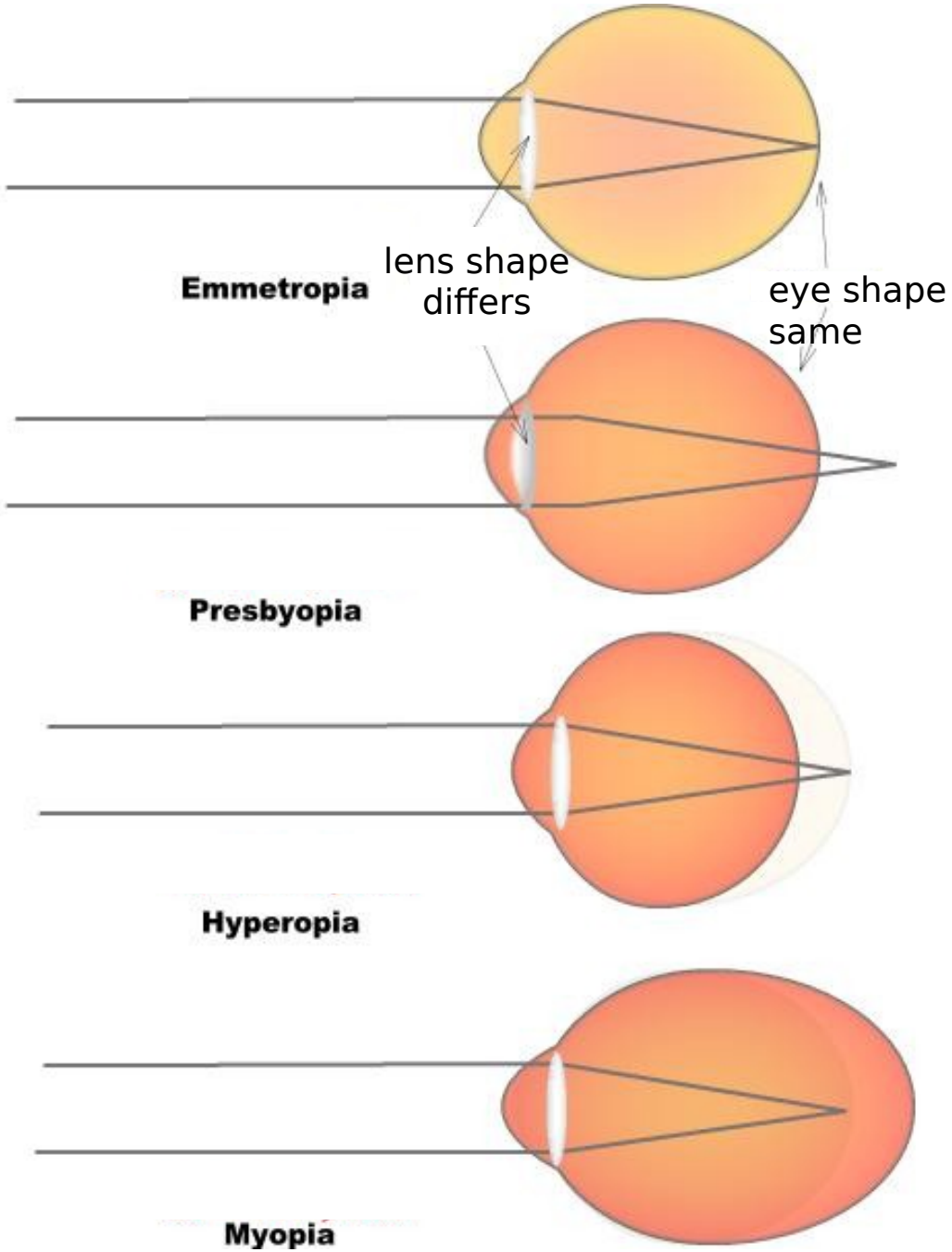
Hyperopia treated with convex corrective lenses (have a positive optical power).

Presbyopia = associated with aging in which the eye exhibits a diminished ability to focus on near objects. Likely due to a decrease in elasticity of the lens and perhaps changes in the lens's curvature.

Astigmatism - is caused by the shape of the cornea which prevents part of it from focusing light onto the retina. This results in a blurred area of the visual filed within an otherwise clear image.

These conditions a tive errors" as they involve changes in pent' or focused as it enters the eye.





Normal Vision
Light (image)
focused
on fovea of retina

Light focused
behind fovea
of the retina

Lens is less flexible

Light focused
behind fovea
of the retina

Eyeball too short

Light focused
in front of
fovea
of the retina

Eyeball too long